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SYSTEMS AND PROCEDURES QUARTERLY

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As a member of this organization, I recognize that I have an obligation:

To promote the advancement of systems and procedures throughout all management. I shall uphold the standards of our Association and cooperate with others in the dissemination of knowledge on developments in our field.

To my employer and my fellow member whose trust I hold. I will endeavor to the best of my ability to warrant this confidence by advising them wisely and honestly.

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Not to accept commissions for the sale of equipment to my employer or my clients.

Not to use any knowledge gained of the internal conditions of the business of a fellow member's employer to further my own personal interests with that company or discredit the fellow member before his employer.

I accept membership in this Association with a full knowledge of the responsibility it imposes upon me and I shall dedicate myself to the discharge of these obligations.

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—from the Association's By-Laws

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No Two Alike

OFFICE systems can never be an exact science. Certain basic principles can be adduced, but no two systems will ever be alike in all details. Differences of product, plant, personnel, environment, and many other factors have subtle ways of making themselves felt.

Even a single company operating branches for identical purposes in different sections of the country will find that local changes will creep into any system which is applied to two or more of the branches. For example, a prominent fuel company found that a sales accounting routine which had been installed in several of its branches had to be altered in certain localities because the prescribed accounting machines could not be serviced in these areas. Another company, operating several factories manufacturing textile products, which were located within a hundred-mile radius, was prevented from installing a common payroll method because the advantages to be gained from uniformity were more than offset by the employee dissatisfaction which would have been aroused by the change.

Every man experienced in systems work probably has within his memory at least one case of the vain attempt to strait-jacket one company with a system taken over bodily from another. Wherever such a course involves office methods, the systems man should be called in to evaluate the proposed and existing systems and, if it is decided to make the change, to integrate the new system with all affected organizations.

Every systems man worthy of the name will be happy to welcome a beneficial change even when it is someone else's idea. At the same time it is his duty, if he is true to his training, to oppose any change where no appreciable benefit is discernible.

But if, in the teeth of the evidence, management decides to accept a proposal which the systems man has done his best to suppress, he can't go off and sulk in his tent. He still has a job to do—that of installing the accepted procedure and realizing the advantages expected by management.

To systems men such tasks are familiar fare. But, although they may at times be distasteful, they are at least never monotonous—*because there are no two alike.*

What Price Business Electronics?

By John S. Coleman

AMID today's news of atomic energy and speculation on interplanetary travel, it is only natural that the field of electronics should be infused with a spirit of glamour and high adventure. Electronics in its many uses, including its use in business, has been invested with an air of magic and the promise of wonders. The electronic business machine is a creature of incredible computing power, and an internal memory that puts both women and elephants to shame. It is, says one leading exponent of the art, also a creature of temperament: it occasionally gets tired, gives wrong answers, playfully sounds buzzers when it is supposed to flash lights, and generally confounds its attendants.

This is all very good. It has certainly captured the public attention. I think it would be safe to say that a mere computer of the first rank would have pretty much the same news value as a Washington senator, or a three-star general. And to a very great extent, this public interest has basis in fact, for it reflects the impressive performance of such well-known computers as Mark 1, the Bell Relay Calculator, Eniac, Binac, and others. In the two seconds it may take a desk calculator to do a multiplication, any self-respecting electronic brain will do 5,000. They have not only condensed to an astounding degree the time required to do the figuring work in scientific and engineering problems—they have opened up avenues of mathematical enquiry which were barred by high labor costs before.

These achievements have not been lost on the office equipment industry. Today that industry is spending more money on research and development than ever before. And it has engaged the right people to do the job. Many of the scientists who helped develop new high speed computing techniques in defense projects during and after World War II, are now working in the laboratories of office equipment companies to apply these techniques to business processes.

My reason for mentioning the colorful manner in which this new science has been introduced to the public, is that I think it is responsible for the notion that the computer can be lifted as is, out of the laboratory, plugged into a wall socket in the business office, and put to work. Here is a kind of rough-and-ready logic. The new equipment computes at incredible speeds. Business accounting means lots of computing. Then why continue with present horse-and-buggy methods? Why not harness debit and credit to the vacuum tube and take off in a cloud of electrons?

Perhaps we can find the answer by considering the nature of present electronic equipment, and the nature of clerical procedures themselves. The kinds of equipment I am talking about, and that have been tagged as potentially useful for business purposes, are the giant computing machines that we have mentioned, such as Eniac, which was their prototype. I am certainly not going to attempt to explain what makes such equipment work. Even though engineers in my own company have built a large-scale computer which is now being used in our own laboratory, although we are producing and selling its components for engineering and scientific use, I must admit I don't understand it very well myself.

But we all know that our computer consists of these main elements: (1) A mechanism for receiving and storing information: (2) a mechanism for processing that information at very high speeds; and (3) a mechanism for producing the results of the processing in useful form. Nothing could be more logical: a mechanism for asking a question, a mechanism for mulling it over, and a mechanism for delivering an answer.

But there is not now the balance in these elements that my stating them might suggest. Its present design reflects the special requirements of the scientists and engineers who have been its chief users. They have been primarily interested in its computing ability: in its astonishing speed in performing the mass of arithmetic operations

"The foregoing observations are not made in the spirit of a critical onlooker. . . . We are not onlookers—we are participants, and as an industry we stand to benefit by advances in this field. . . . I am merely trying to get a little ballast in this electronics balloon so that it won't sail clear out of sight."

into which their problems are resolved. By comparison, the amount of material presented to the machine—the questions—and the amount taken out, in the form of answers, has been relatively small. So it is that we have an overdeveloped central mechanism, a computer with hair on its chest, so to speak—flanked by input and output mechanisms which, comparatively, are still in the toddling stage.

How does this design lend itself to the work of business? Too well and not well enough. The computing mechanism is too powerful. We don't need a steam hammer to drive tacks. A giant brain, with a voracious appetite for great gobs of figures, would starve to death on a business diet. We need a modest, junior-size brain here. For most of the work in an accounting problem is in gathering and organizing the information to be processed, and then after the very simple calculations have been made, distributing the processed information in a form in which it can be used. Accounting figures require much less computation than scientific or engineering figures, but more handling on arrival and departure. So the designer of electronic business equipment will wisely plan a computer of middling power, and then give his best to building an input mechanism which will handle a great deal of information rapidly and perhaps from many sources; and an output mechanism which will take the information from the computer and very rapidly make it available, perhaps on a large number of different documents, to the people who will use it.

Perhaps we can clarify this position we have taken on present electronic design by considering for a moment the two major types of clerical work. The first type is concerned with producing and handling the paper required in everyday business. The second type consists of the preparation of reports to management.

I like to use accounts receivable as a good example of the first type. Let us suppose, for the sake of illustration, that our better half has visited the local department store to replace the sofa which we had fondly regarded as just nicely broken in, and which she insists is broken down. She finds exactly what she has in mind, of course; charges it, and the clerk writes up the sales slip. In this transaction the major outgoing document is the monthly statement to you. In the store's working files are your ledger and the journal record. Then, of course, the figures on this transaction are incorporated in control totals prepared for checking purposes, and summarizing totals for entry into the general books of the store.

The arithmetic here is very simple. It consists merely in adding the price of the sofa to your account, and subtracting the payment when your check is received. And it's certainly not much of a computing job to figure the sales tax, if any, or the interest, if you are buying the sofa on time, and the amount of each regular payment.

The biggest share of this job is in bringing the input data—the charge and your payment—into the system, maintaining the files, and preparing the output data, or your statement. For this reason there would not seem to be much point in recording transactions such as this on a special medium—a magnetic tape, for instance, as would have to be done in an electronic system—for later high-speed automatic computation. Of course, accounts receivable is a less complex job than certain others in which high-speed computing might be of value, but it does illustrate one important type of problem met in practice.

The story is different on the second type of clerical work—reports to management. Here the data which we can get from the documents already mentioned are tabulated and summarized so that management may be able to stand back and appraise the company's operations, usually over some fixed reporting period of at least a month's duration. Generally these reports must be prepared promptly if they are to be of real value. Reports on sales, for instance, may consist of breakdowns of total sales by department, type of product sold, sales clerk, or any other classification of interest to management. In this kind of clerical job, a single figure—a single item of input data—may be used many times, since it appears in many different totals. Though the input problem may still be the primary one, internal processing, and especially accumulating and sorting, are also important. In this type

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of clerical work it would seem that there would be much more justification for recording the data on some special medium for later automatic processing. Here the case for electronic automatic data-handling in its present form, is much stronger.

In addition to the great computational needs, there is another very important difference between the work of the scientific and engineering professions, and of business, which should influence the design of data-handling equipment. This is in the way the work is scheduled. In the field of science, the work schedule is not rigid. Savings in time, of course, are very welcome—but there are no do-or-die deadlines. If one of our robot mathematicians has a failure while sailing through a monster computing job at a rate it would take a dozen pencil-pushers working 24 hours a day for weeks to duplicate, then it doesn't make much difference if it takes two hours or eight hours, or even a couple of days to locate the trouble and make repairs.

All-important payroll

But the business work schedule *is* rigid. Promptness and regularity of performance are first principles of business efficiency. Consider the payroll from this standpoint, for instance. Checks are given out on Friday with religious regularity. This regularity is a phenomenon on which family and community economics are hinged. If checks were not available until Saturday it would produce approximately the same effect as if the sun rose in the north instead of the east, except that it would make people a lot madder.

We can afford to have our equipment shut down a certain maximum length of time. But anything over that, and we're in trouble. If it takes six hours on Friday to run our payroll, we have to be able to guarantee that each Friday the machine will operate successfully for six hours, or have a substitute brain warming up its tubes on the sidelines.

Another aspect of the rigid business work schedule is this: In many operations, computing speed beyond a certain point is superfluous. If business meets its deadlines without too much effort with equipment on hand now, is there an advantage in increasing speed for the sake of speed alone? If the department store we mentioned records properly each day's crop of invoices and payments, and if the statements are issued before the store's deadline, is there an advantage in stepping up the clerical productivity of the equipment? This would be something like dashing down to the depot in a frenzy of speed and climbing aboard our car an hour before train time. Of course, if we *did* speed things up and produced a nice comfortable breather before the deadline, we might find something to do with the idle machine capacity. But the trouble is that such time-sharing is not all gravy, because it usually leads to greater complications in the scheduling.

So in such cases as these, increases in speed would not truly represent an advantage for the company. The only sound basis for appraisal would be the *cost* of the proposed system; and cost means not only the purchase price and the maintenance cost of the equipment, but the number of people required to do the job in hand.

The foregoing observations are not made in the spirit of a critical onlooker. We are not onlookers. We are participants, and as an industry we stand to benefit by advances in this field. I am merely trying to get a little ballast in this electronics balloon so that it won't sail clear out of sight. We have been treated of late to a vision of the completely automatic office. It is a concept that is at once exciting and sobering. The remarkable thing about it is that hardly anyone seems to be around. The happy chatter of the office girl has been replaced by the silent and sexless wink of control lights, and the faint humming of giant brains at work. There are hardly any mortal brows left to raise a sweat on. Only two lonely figures occupy the stage: an operator and perhaps a maintenance man.

What is even more remarkable is that this office seems to be so pat, and the conditions under which it works so beautifully cooperative. There are no exceptions to the rule. All work is handled on a standardized mass production basis the whole day through. The customer who has four invoices outstanding and decides to pay only the first and last, and takes the wrong freight allowances in the bargain, has obligingly disappeared. Nor are we any longer harried by the savings bond-holder who wants to know what bonds he owns, but can't remember when it was he bought them, whether they were in his or his wife's name, or what his address was at the time. And a wonderful transformation has been worked on retail charge customers. When they appear to inquire about their accounts, they don't barge up to our windows, catch-as-catch-can. They carefully sort themselves out and line up in the order of their charge plate numbers. A truly impressive sight.

Realistic program

Now with all these chuck holes in the business highway filled in and tamped down, the automatic office speeds on, with a low steady purr of contentment. The clerk? The dodo bird has moved over to make room for him. He is extinct.

In venturing disagreement with what might be called the Sunday Supplement school of enthusiasts, I am most certainly not taking the stand that automatic processing in accounting is beyond reach. The developments you have seen clearly show that remarkable progress has been made. I am merely suggesting that we cannot reach it by a flight of the imagination. We can and will move toward that goal through a realistic program of research and development. But in the process, we must recognize that

actually the future of electronic techniques in business is pretty much a matter of economics. The fact that present automatic equipment could be applied to accounting work is no guarantee of its practicability. The real determinant is whether business can afford to use it.

Cost is paramount—and when I say cost I do not just mean the price tag on the equipment. Operating cost alone is a big item. In the great majority of all mechanized accounting operations, the annual salary of the operators often exceeds the total purchase price of the machine. And the salary the operator is paid represents the cost of introducing data into the system manually by some kind of keyboard equipment. So it would seem that if we are to speed the day of the push button office, we must begin by providing equipment which will raise the speed of input and thus cut down on the cost of operating the equipment. My company has had some success in the laboratory in designing equipment that will automatically pick up information and introduce it into the computation process without the aid of a human agency. It works in the laboratory, but it has a long way to go before it will be commercially economical.

Another long-standing challenge to the automatic system lies, as we intimated before, in random access to large files of information. When a customer walks into his department store and asks how he stands, how do we go about finding the balance in his account? There may be 20,000 charge customers. Must we run through all other accounts before his in the file, numerically or alphabetically, in order to get it? It's a particularly knotty problem.

Maintenance is important, too. The ratio of annual maintenance cost to purchase price varies significantly from one type of equipment to another; and the probability is that this ratio is considerably higher in vacuum tube equipment than it is in mechanical equipment. This points up the need for further work on equipment reliability and longevity, and on faster fault-finding and maintenance methods.

Development continues

Now as we find solutions to these problems—as we bolster our giant brain on its input end—it will become even more apparent that the output end is still sagging. And the chief reason for the interest in automatic computing equipment is the conviction that it can be made to produce accounting documents much faster than they are produced by present methods. But at the present time there are no printing devices in commercial use which can take the information produced at high speed in the computer and produce documents at comparable speed. We are making a little progress in this field, though. My company, for instance, now has a rather fast output mechanism, one model of which has been used experimentally in the offices of an insurance company for printing premium notices. It is capable of printing at the rate of 2,000 lines a minute. While we feel that this is a creditable performance, we know that much work must be done on this phase of automatic data handling before we will be ready to take orders for commercial installations.

Yes, there is much that is potentially useful to business in this new and exciting field. But units must be designed which are simpler, less expensive, more reliable, and easier to maintain. And to achieve a true balance in our new system, we must work to boost the efficiency of the input and output mechanisms up to the level of the computing mechanism. And we must approach these challenges with the wisdom that recognizes that the old is always needed to add stature to the new. There is no clean break between present and future, even in applied science. Electronics is no scientific prima donna that must command the stage. Because it has swept on does not mean that mechanics must slink off. It must have support. Mechanical and electro-mechanical techniques will continue to be indispensable. And this will hold true not only in small and medium-size business, but in big business, with its big-volume computing needs, as well. For a long time to come, non-electronic equipment will figure importantly in the most advanced automatic systems.

Important goals ahead

I would certainly not attempt to predict just how far around the corner this new era in accounting is lurking in the United States. The best I can do is take cover behind the statement that its imminence depends on how rapidly we get along with design improvements and price reductions. The progress we are making in this field can well have a very significant effect on the measure of the national power to produce for both civilian and military needs. Riding on the back of a civilian economy operating at the highest rate in its history, is a burden of arms production that is growing heavier and heavier. Our ability to walk off with it, without wobbling at the knees, is going to depend a great deal on how well we use our human resources. The electronic circuit is potentially a magnificent conservator of those resources. In its speed lies the promise of undreamed-of efficiency in office operation —far more effective management control of the complex machinery of business and industry. Thus, in working to perfect electronic equipment, we will do more than reduce clerical costs. We will be adding generously to the country's ability to produce and arm for the uneasy years which lie ahead. These are goals well worth working for.

The foregoing paper was presented by Mr. Coleman at the fourth international conference of the Systems and Procedures Association of America in Chicago late last year.

Cutting $500,000 in Half

By Gibbs Myers

(2nd of two articles)

LIKE most large organizations during the post-war readjustment period, the manufacturing firm referred to in this article faced a serious curtailment of business due in large part to the loss of foreign markets. In view of the company's soaring overhead and dwindling sales, a program of retrenchment was in order. A major source of potential economies existed in the general service department. For a year and a half a thorough analysis was made of this department which was composed of the stationery stockroom, the reproduction services, the communication services, the office machine and furniture control unit and the methods and procedures section.

At the outset, the general service department had seventy employees and was spending more than $500,000 a year for labor and materials. The problem was to operate these services more economically and more effectively. The first installment of this study which appeared in the September 1950 issue of the QUARTERLY, dealt with printed forms, stationery and office supplies, and reproduction services. This final installment covers the company's communications services and the office machine maintenance program.

COMMUNICATIONS

Mail Service

The objective here was principally to reduce the personnel, although constant attention was of course given to obtaining the cheapest possible rates on all matter sent through the U. S. Mail. At the start the force consisted of a supervisor and six mail girls, plus a bit of overtime almost every day. By establishing a single mail station for each department, properly labeled; laying out the shortest possible mail routes; providing new sorting racks and mail carts; setting a deadline for the delivery of outgoing U. S. Mail to the mail room; and insisting on the proper addressing of inter-office mail, it was possible to reduce the force to a supervisor and three mail girls with all overtime eliminated.

Telegraph Service

Here also, the objectives were to get the cheapest rates and to reduce the personnel. By simplifying the duties of the two girls who operated the teleprinters it was possible to eliminate one of them. The simplifications related to such elementary things as the work layout and the method of processing and distributing telegrams. The change in work layout consisted in a rearrangement of the location of the operator's telephone, typewriter, and Western Union teleprinter so that she could reach all three with a minimum of effort. To reduce processing time the operator was instructed to type the distribution on a single line on the telegram instead of on four lines. Later two of the four copies made of each telegram were eliminated.

The cheapest rates were obtained by having the operator edit all outgoing telegrams to reduce wordage wherever possible without affecting the meaning, and by making greater use of day and night letters. A study of telegraph rates showed that a message of less than 20 words could be sent more cheaply as a full-rate telegram; for 20 words or more a day letter was cheaper—and Western Union promises delivery of day letters within two hours. Night letters are even cheaper, the rate for a 25-word message being about the same as for a 10-word full-rate message. After a study of these rates it was made a practice to send telegrams of 20 words or more as day letters, and after 4 p.m. as night letters (except to the Pacific time zone), unless the head of the sending department specifically requested full-rate service, or if extreme urgency was otherwise indicated. Of course, full use was made of the savings to be had from serial-rate service wherever more than one message a day was being sent to the same address. An analysis was also made of the incoming collect telegrams each day and action was taken to reduce their number.

The actual reduction in monthly telegraph expense was negligible, since at the same time encouragement was being given to the substitution of telegrams for long distance telephone calls—but a noticeable reduction in the average cost per telegram was achieved.

Telephone Service

At the inception of this program the telephone service costs were increasing at a frightening rate, and they reached $14,000 a month before a way was found to curb them. It took a lot of hard work to accomplish this objective, but within a year the monthly costs were down to a low of $7,000 a month. The telephone service personnel was also reduced from 17 to 11 employees, and at the same time the hours of switchboard service were increased from 10 to 14 hours a day.

Not only was the company able to achieve phenomenal general service economies in a retrenchment period—but procedures and policies were established for continued low operating costs in more prosperous times.

The program for reduction of costs embraced the following steps:

Reduction of switchboard rental costs. The significant items eliminated were three of the ten PBX positions, two of the three five-jack conference plans, and the multiple-line cabinet used by the page operator (by having the paging done from the first position of the switchboard).

Reduction of trunk and tie-line costs. Owing to the plant's location there were two sets of central office connections: one series of trunks to the local manual office for incoming calls and another series to the nearest metropolitan dial exchange for outgoing calls. The latter were more costly because of the mileage charges involved, but were justified because they speeded up the handling of outgoing calls. By a careful study of the trunk activity records it was possible to reduce the local trunks by 25 per cent and the metropolitan trunks by 50 per cent. Then when the local office was converted from manual to dial service all of the metropolitan trunks were discontinued and the local trunks were increased proportionally. Thereafter, by continuing to watch the trunk activity records, it was possible to make further reductions from time to time, with full assurance from the telephone company that these trunks could be reinstalled, consecutively numbered, on short notice, whenever they were needed. One of the seven tie-lines to other plants of the company was also discontinued without affecting the quality of the service.

At the same time the New York trunks were increased from three to five to care for the heavy traffic in that direction, thereby reducing the cost of these calls and speeding up their handling at the switchboard. As soon as all five New York trunks were working the operators were instructed to advise callers that "All New York trunks are busy" whenever that condition obtained, and by using this technique it was possible to place all but a sprinkling of the New York calls over these trunks.

Reduction of long distance calls. The biggest item on the telephone bill and the one that was toughest to cut was the cost of long distance calls. At the start a series of monthly bulletins were issued telling how to save money on communications to distant points. The material for these bulletins was furnished principally by Western Union which was one of the firmest supporters in this particular phase of the program. To bring these messages home to each department a tabulation of the long distance telephone expense of each department for the previous months was printed on the reverse of these bulletins.

The campaign was not too effective in its immediate results, but it may have done something to soften up the opposition. Several months later more stringent action was taken. The number of persons authorized to make long distance calls was slashed from 300 to 100 and later to 50; and a system of daily reports was instituted. This meant that each division director received each day from the chief telephone operator a list of the long distance calls made by his people on the previous day, showing name of caller, place called, number of minutes duration, and cost of each call made. This new effort brought quick results. The monthly cost dropped within six months from $4,000 to $2,500.

Reduction of local calls. The cost of local calls was also reduced by trimming the list of authorized employees from 400 to 175 and by having the telephone operators query the callers whenever it appeared that a personal call was being made. Within several months the telephone bills showed a 50 per cent reduction in the cost of local calls.

Reduction of extension equipment. One other big item of cost was extension equipment. At the outset the company was well provided with extensions and bridges, many of which were equipped with buttons, buzzers, busy lamps, intercommunicating lines, and other fancy equipment, which built up the costs. By carefully examining each department's needs, and applying pressure where necessary, within a year it was possible to disconnect almost one-third of the extensions and bridges while at the same time eliminating all but a pittance of the feature equipment. This effort not only meant a sizeable saving in monthly costs, but it also helped measurably to reduce the traffic load on the switchboard.

Discontinuance of night connections. Another change which helped to control and reduce telephone costs had to do with night connections. Customarily the switchboard was closed at 6 p.m. each evening and about 30 night lines were put up to serve department heads, groups working night shifts, and others who needed or thought they needed them. Each month when the long distance toll slips were checked against the telephone bill numerous long distance calls were found which could not be accounted for. So a night operator was hired and the night

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lines were cut out. After that it was possible to account for all but a few dollars worth of calls each month, and it was also found that there were very few long distance calls made after the night operator went on duty.

Analysis of Telephone Company charges. There is one other point worth mentioning in this story on how to reduce telephone costs. In order to see how the monthly equipment rental costs balanced out against the amount billed each month, the telephone company was asked for a breakdown. A careful review of this information revealed no discrepancies of any significance. However, there was one item that looked worth questioning. This was a cable-carrying charge for two extensions located in a company building which was less than half a mile away from the main plant. Upon inquiry it was learned from the telephone company representative that this charge was based on a previous requirement for a multi-pair cable to this location. This requirement no longer existed but the cable-carrying charges went on and on. By bringing this situation to the attention of the Telephone Company it was possible to get the cable-carrying charge replaced with a normal off-premise mileage charge of only a few dollars a month. This incident is related because it may be possible that other companies are paying some high costs based on old requirements or arrangements that are no longer valid. However, the Telephone Company will always be found very reasonable and cooperative. Cultivate good relations with them. They will often go to surprising lengths to meet unusual demands which you may have to put on them occasionally.

Simplification of clerical routines. Just one more word on reducing telephone costs. It was previously mentioned that telephone service personnel was cut from 17 to 11 employees. This was mainly due to traffic reduction, but it was also partly due to simplification of clerical operating practices. Telephone supervisors and operators are by the very nature of their occupation creatures of habit. If their clerical routines have not been reviewed recently it might be worth while taking a look. Some practices may be found which can be simplified and some operations that can be eliminated. This has reference of course to auxiliary duties connected with the operations of a private branch exchange, not to basic switchboard operating practices.

OFFICE MACHINE MAINTENANCE

The last phase of the control and cost reduction program under discussion deals with office machine maintenance. The two problems faced were elimination of rentals and provision of adequate machine maintenance at a reasonable cost.

To discuss the rental problem is more or less academic, since it no longer exists on a widespread scale today. However, it is mentioned briefly merely to show how a particularly vexing situation was overcome. These rentals were a carry-over from the wartime period, during which office machines were not always available for purchase, and even so, it was felt that many of the company's burgeoning demands for machines were only of a temporary nature—therefore the rentals. The first step was to instruct the office machine supervisor to prepare new purchase requisitions for all machines on rental, combining all machines from a common supplier on a single requisition and specifying that all rental periods were to run concurrently on a calendar month basis and were to be invoiced monthly on a single invoice. This step reduced the number of invoices which had to be processed each month to less than 10 per cent of the original.

Also, to each purchase requisition mentioned above there was appended a list of machines rented from the particular supplier for which the company was being billed but which could not be located after an exhaustive search. The suppliers were advised that these machines had been lost and they were requested to stop rental charges immediately and submit claims for the value of these machines. It should be mentioned here that numerous losses probably occurred in the course of the many moves and transfers which preceded the final consolidation of operations in the company's new central plant. When the claims were all settled, even after whittling them down by about 20 per cent, several thousand dollars had been paid out, but it was a certainty after that that every invoice signed covered a machine whose whereabouts was known.

Haphazard repair system

All the time this operation was in process rentals were being eliminated as fast as possible in view of management's natural reluctance at this time to authorize the purchase of any new machines. As fast as surplus machines were picked up they were either returned if they were rentals, or if they were company owned they were used to replace rented machines. After all the obvious surplus machines had been taken up, each department's requirements were surveyed and on the basis of the findings it was possible to commandeer enough additional machines to eliminate most of the remaining rentals. The rentals were finally reduced to zero when authorization was granted to purchase 14 new special-purpose electric typewriters that were badly needed and 15 key-driven calculators.

The other part of the office machine problem deals with office machine repair and maintenance. For years the company operated under a haphazard system that was costly in lost machine and operator time, poor average condition of machines, and multiplicity of paperwork for each individual repair. Every time a machine broke down it was necessary to write out a purchase requisition for repair, phone a service company, and wait until the repairman got there. Then each individual transaction

was consummated by means of a purchase order, with subsequently an individual invoice to be processed and paid for each repair job.

Here the problem was not so much the actual dollar reduction in the cost of repairs as it was the institution of adequate service. The means of solving this problem appeared to be to put all machines on maintenance service contracts, but very few of these contracts had been authorized in the past, so a selling job had to be done. A number of typewriter service companies were invited to bid on the job, and finally one of the large nationally known typewriter manufacturer's service organizations was selected as the best bet. This company offered an attractive annual rate per machine plus a very low rate for overhaul, where required. Since individual overhauls were then averaging almost twice this amount, this provided a talking point to help sell the proposal. It still looked doubtful that it would be wise to place every typewriter on service contract so only those machines receiving the heaviest use, constituting less than half of the total, were selected and a service contract was proposed to cover these. By a supplementary arrangement, the service company agreed that the repairman who was to be sent to the plant every morning to fix any ailments of machines on contract, would also repair at regular rates any other machines needing attention. The cost of these additional repairs was to be billed monthly so there would only be a single invoice to process. This proposal was approved, and the arrangement has worked out very satisfactorily. After that when a machine broke down, no typist had to wait longer than until the next morning to get it fixed.

Having discussed point by point the five phases of the program for the control and reduction of general office expense, it should be added that for the most part this work was accomplished by the supervisors involved and in some cases by the workers themselves. With the program spearheaded by the general service manager and formulated by the methods and procedures group working in conjunction with the supervisors, it was carried through to completion without outside help. Meritorious suggestions from the reproduction service manager, the stationery stockroom supervisor, the chief telephone operator, the mail room supervisor, and other members of the department were incorporated in the program and helped to round it out.

However, lest the impression be formed that these reductions were due entirely to the efforts of the General Service Department, it should be pointed out again that the period of this program was a retrenchment period for the company which was necessitated by a loss of foreign markets, resulting in a cut of about 45 per cent in sales volume and a corresponding reduction in the number of employees. The job in General Service was to push down the expenses to a lower level commensurate with the company's reduced operations. Despite certain fixed and semi-fixed expenses these costs were reduced to half of what they were at the start of the program.

Later, when new products and new markets were developed, the sales and the working force began to climb toward the previous level, but the reduction program had been carried out so well that it was comparatively easy to prevent the general office expenses from surging disproportionately.

COSTS in Microfilming Records -

By C. E. Noll

OUR experience with microfilm equipment involves 424 trans-file boxes of records—some letter and some legal size, all standard 24-inch depth. Half of this group of files were job cost files in file folders with store tags, material invoices and labor data, and the other half were purchase order files with a copy of the purchase order and supporting copies of invoices. The record storage facilities were taxed to capacity and we believed it would be cheaper—this was an estimate based somewhat on the claims of the equipment manufacturer that we could produce a certain number of shots per hour—to micro-film these records than to arrange storage of the records elsewhere.

We rented a Recordak commercial machine model RE-1 and set it up right in the record storage area. Right away we ran into trouble. We found to our sorrow that practically all of these records we were going to film had an abnormal number of staples in them. It seems every time a piece of paper was filed it was stapled into the folder. You can see how this was going to have an adverse effect on our labor costs as all these staples had to be removed before papers could be fed through the machine. My guess is it probably came close to doubling the man hours that should have been required to do the job. In the latter stages of this job which stretched over approximately one year we did have some free help which offset some of this extra labor expense. Our ships were tied up by labor trouble and we were able to use personnel from other departments. If you are considering micro-filming it will be well to remember this staple and clip obstacle.

(Continued on page 20)

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Statistical Charting - Tool of Management

By William A. Miller

(From a paper presented at the SPA Institute meeting in Los Angeles in November, last year)

SOME sage of bygone days, stated that "man's judgment is no better than his information." If such a remark is true, then it must also apply to everyday business management. It is, therefore, necessary that management have at its finger tips at all times a concise picture of the trends of operations, production and personnel to enable it to make decisions which are based on factual information rather than upon figments of imagination.

There is perhaps no subject which is more misunderstood than that of statistics. To most laymen the field of statistics is found behind the ivy walls of our universities or in the inner sanctums of governmental buildings. It will be my endeavor to show that statistical charting is not mysterious, fantastic and farfetched, but rather that it is a real, understandable and enlightening tool of management. There are literally innumerable statistical procedures, but again, this discussion will deal with the typical statistical organization in a modern business and will deal particularly with statistical charting and statistical methods which offer a systematic approach to effective management.

Most business concerns have, somewhere within their organization, a group of persons to whom has been delegated the responsibilities of either acting as a statistical section or are, in fact, so named. These people invariably have basically the same mission—that being to compile, sort, interpret, present, analyze and make forecasts of pertinent information. Also, we find that the statistical sections generally report directly to some member of top management. It is, therefore, understandable that to accomplish its mission, the statistical section must have access to all information, records and documents necessary to complete its studies. Statistics must not be biased if they are to be factual and accurate weather-vanes and compasses for top management decisions. Biased statistics can be created, due as much to omission as to ineptitude.

In any study of modern business methods, reasoning must be a guiding factor. The importance of reasoning cannot be overstressed but, at the same time, a sharp delineation must be made between reasoning and dreaming. Reasoning transforms statistics from a complicated set of unintelligible conclusions into a dynamic implement of top management. In any statistical study, you should determine what factors have influenced your calculations. Weigh these factors in their importance, weed out the irrelevant material; then condense the material to a minimum volume for quick and easy interpretation.

The modern business concern has within its files all the basic material necessary for the compiling of pertinent statistical information. This basic raw material includes the balance sheet, profit and loss statement, sales orders, invoices, inventory costs, manufacturing data and personnel records. The withdrawing of certain related information from these sources and comparing them (as in a ratio) can give to business its current and historical trends of operation.

It is in the final preparation of the assembled information that ingenuity must be put into play. Some executives can best read only figures to form their conclusions. Others insist on charts which show past performance and indicate trends. The mission of a statistician is to determine the type of person that is to use the final report or chart and conform to the desires and requirements of this person in so far as facts will permit. Charts are undoubtedly the most generally accepted means by which the greatest amount of information can be conveyed for assimilation in the briefest time. A picture may be worth ten thousand words, but it is always wise to be prepared to supplement the charts with schedules of the actual figures.

The principles of charting are simple, although the charts often appear complicated because of the basic material being charted. Common to all charts, however, are the titles, footnotes, points of origin, and the use of color. Since the present trend is toward simplification and instantaneous understanding, each of these constant factors is undergoing considerable change.

Color in charting has transformed the drab, dull charts of yesterday, to today's pictures of interest. Color and color combinations, used properly, accentuate important features and highlight fluctuations. They facilitate and enhance reader assimilation.

Statistical charting serves as a valuable compass for top management decisions affecting the company's future. Here are some of the principles involved.

The chart designer today has five basic types of charts with which to present the assembled information. The five types are: bar charts, line charts, circle or pie charts, logarithmic charts, and the latest type, the third dimensional chart. It must be borne in mind, however, that frequently two or more of these types can be successfully encompassed in one chart.

The *bar chart* is generally designed to have each bar represent a specific value for a specified time. Bar charts usually start the bar from a base line and extend vertically. However, if trend is important, the base line is extended vertically and bars are laid on a horizontal plane, so that the trend from the ends of each of the bars will assume a vertical position. This type of composition is for ease of reading and the rapid assimilation of represented facts. Bar charts are generally used for lengthy periods of time. This type of chart, although simple, is rather cumbersome and can easily be misunderstood unless properly designed. A common practice today is to split the bar into sections to show the relationship of each section to the whole bar. This practice is, however, gradually falling into disfavor and the line chart is supplanting it.

The *line chart* is almost as simple as the bar chart, but has an additional advantage, the inherent ability to portray ratios and trends in much finer precision. The idea of charting figures to tell what is happening to one item is, generally speaking, a waste of time and effort. If, however, the factor to be charted can be compared, as in a ratio, then the chart assumes greater meaning and produces significant relationships which relate a story to management. In this instance, two items have been charted simultaneously. The line chart is frequently used for presenting fluctuations over short periods of time, as in hours, days, or weeks. National banking and financial concerns favor this type of charting.

The *circle chart*, as its name implies, is a circle. It is split into segments to show a relationship of each segment to the whole. This chart uses considerably more space than the charts previously mentioned and can only portray a status as of a particular time. Trend cannot be indicated. This type of chart is being used rather successfully, however, to convey simple business facts to stockholders.

The *logarithmic chart* is complicated, yet accurate. It enables facts which have extremely great variances to be compared one to another. The log chart, as it is frequently called, is composed of one or more cycles. Each cycle is composed of nine lines. The space between these lines varies in width in the same proportion as typical logarithmic tables vary in value. The log chart is computed from a base of 10. Logarithms which fall into this category are called common or Briggsian logarithms and are universally used in statistical computations. Frequently, four, five, or six different items can be charted on one log chart and retain maximum efficiency. Caution must be exercised when designing this type of chart so that the lines of value will not cross each other, or if so, very infrequently. The crossing of lines on a log chart tend to distort the ratios and confuse the reader. The importance of the log chart is that parallel trend lines reflect proportional rates of change and show the relationship between two or more series which differ widely in amount.

The *third dimensional chart* uses the general background principles of a bar, or line chart, the difference being that the bars are drawn to show their height, width, and depth. This type of charting gives the reader the impression of depth but is complicated in design. However, it is an aid in rapid reading of pictured data and more than compensates for the designing problems involved. Color should be used in this type of chart as it will be an aid in defining the bars. The third dimensional chart is particularly suited for the simultaneous display of line ratios and bar values.

Each of the foregoing charts was designed originally for certain defined types of chartable material and each of the charts is now used in a variety of ways, each with its own limitations. In statistical charting, do not present all information in one style; for instance, all bar charts or all pie charts. Try to develop new ways of presenting the information in chart form by using the best features of several types of charts. Creative charting is a very profitable phase of statistical endeavor. Try to be different, exact. Show the fact, and let the chart tell a story.

Some of you may be interested in starting a statistical section and may want to know the type of personnel, equipment and procedures necessary to effectively pursue the problems that can be presented to such a section. Others of you may already have statistical sections and have already formulated your ideas of the various matters that pertain to such a section. However, if such be the case, you may be interested in the following as a sort

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of check list on your present statistical operations.

Because a statistical section utilizes brain rather than brawn—the minds of its personnel more than mechanical tools—the first important consideration is the proper selection of personnel to staff the section. It is difficult to visualize a well-rounded statistical section that would be composed of less than three people. The extent to which this number can be expanded is limited only to the amount of work required to be performed by the section, the size of the company's operations, the amount of analytical research required, and the desire on the part of management to maintain the payroll. Statistical personnel normally must have considerable education and training before they can be placed in the statistical employment market. It is for that reason that a statistical section is not an inexpensive section to operate.

The staff

The people who operate a statistical section could be titled *statistician*, *statistical draftsman*, and *statistical typist* and *clerk*. Each of these three classifications have certain defined tasks in the ultimate presentation of any statistical information, regardless of whether the information is presented in chart, tabular or report form. The statistician should be in charge of planning the problems assigned to the section, which would also include the design of questionnaires and forms to be used in obtaining data and determining the method of compiling information supplied in various forms. It is also the task of the statistician to prepare layouts and designs, forms, tabulations, and other media used in the compilation of statistical data, and to work out alternative methods of examination and comparisons.

The statistician should also be well versed in statistical techniques ranging from percentages and ratios to correlations and variance analyses. Perhaps most important, the statistician should institute such procedures as are necessary to insure the prompt and proper submission of statistical data and be allowed to make personal contacts to insure such submission. It is also the responsibility of the statistician to be well versed in chart techniques and procedures to the extent that he can lay out, with a minimum of research, the proper charts to be used for the various studies which must be charted.

The job prerequisites for such an individual normally requires a college education, with majors in statistics and accounting, and at least two years of statistical analyses in various commercial organizations.

The statistical draftsman does not necessarily have to be thoroughly experienced in statistical activities to be considered for such a classification. As a matter of fact, very few institutions in the United States train draftsmen along the statistical lines, yet statistical drafting is as specialized a field as drafting in the civil, mechanical and electrical fields. Frequently it is possible to obtain a high school graduate who has had considerable drafting in his school program and who can be trained to perform the work required of a statistical draftsman.

In addition to chart construction, it is the mission of the statistical draftsman to be able to post to various statistical charts current statistical information with a maximum degree of accuracy. He should also be able to design and maintain such other charts and graphs as are required.

The second phase in the establishment of a statistical section has to do with the establishing of standards under which the section will operate. To produce uniform charts and reports and keep costs to a minimum, the sizes of the various charts and reports, as well as the material to be used, must be standardized. In standardizing chart sizes, it would be advantageous in many cases to employ a minimum of three sizes. These could be the large wall or display chart of approximately 30 by 40 inches in size, desk charts 10 by 14 inches in size, and special study charts which can be reproduced for various publications of a size consistant with the requirements of the particular business organization.

From the chart standpoint, the standards must be detailed enough to cover the most minute phases of all detail common to charts. For instance, standards should be established as to whether or not lettering on charts should be freehand or mechanical. This would also include the establishment of the sizes of the letters, as well as character of the letters. Likewise, standards should be set out in manual form and distributed to the statistical section and other involved personnel for their guidance and conformity.

Phase three

The third phase of establishing a statistical section involves the procuring of materials and tools with which the personnel will operate. Naturally, a statistical section would find it difficult to perform its functions without having proper space allocated to it where personnel will not be interrupted by the normal activities which surround most business offices. It must always be remembered that the statistical section, although not a prima donna section, does possess information which is not generally distributed to all who are interested or who may be curious about the work performed by the statistical section. The drafting section must have professional equipment to properly function, which, in the long run, will reduce costs and allow the production of a finished product which management will be proud to display and utilize in its everyday managerial control functions.

I hope I have conveyed the point that statistics and statistical charting are not mysterious, fantastic or farfetched, but that *thought*, *preparation*, *reasoning*, *facts*, *figures*, and *common sense* are the factors of statistical charting—a systematic approach to effective management.

Supervisors as Management Analysts

A work simplification program can proceed without outside assistance.

By John R. Sterling

WORK simplification can be defined as a program to promote efficiency and economy through first line supervision. It involves the training of supervisors to be management analysts over their operations. It results in the installation of improvements from the bottom up. Finally, it is designed to improve group activities rather than individual operations. Under work simplification we are not concerned with the job of any one individual but rather with the total job being performed by an organizational segment. We are not interested in analyzing what Mary Jones does in the payroll unit but rather in examining all the activities of the payroll unit.

Work simplification does not involve any investigation by outside efficiency experts. All of the improvements are effected by the supervisor. Of course, there are some improvements which are beyond the jurisdiction of a supervisor. These must be effected with the help of a work simplification coordinator who has authority to contact all levels of management and amalgamate differing viewpoints which may be present in various organizational segments.

What are the reasons for work simplification? The basic reason is that the supervisor is in the best position to make improvements. The supervisor knows details. The average supervisor is a person who has been promoted from within an organization, has been with the company for a number of years, and therefore has a complete knowledge of all procedures within his organization, and how these procedures are related to the activities of other organizational elements. Any changes initiated by a supervisor will encounter a minimum of resistance. The supervisor is accustomed to giving instructions, and his employees are accustomed to following them.

The accomplishment of improvements through the supervisors has definite advantages over the use of outside experts. The outsiders who only spend a few weeks or months in making a survey cannot possibly become acquainted with all the details of operation and personnel which the supervisor has learned over a period of years. In many cases the wrong approach to an employee by a member of an outside survey team will result in an uncooperative attitude. The biggest disadvantage of the outside survey is that it is a "one shot" affair. After the report is rendered, no further effort is made to improve operations through the application of scientific management techniques. Work simplification is a continuing program which the supervisors are expected to apply continuously while they are employed by the company.

The first step in establishing a work simplification program is to obtain the support of top management. In its initial stages work simplification is a training program, and there is a natural resistance to training programs because they consume time which could otherwise be used for the normal routine operations. There is also a natural resistance to changes. Work simplification involves change not only in the sense that it is a new program, but the very basis for its existence is the change and improvement of existing operations. Supervisors will realize that the program will not only take them away from their work during the training phase but will also require time to consider changes in their operations. This resistance must be overcome by sufficient assistance from top management to convince the supervisors that management is firmly behind the program. Every supervisor must be made aware that his boss expects results. The only justification for the program is that it can produce results in terms of savings. It cannot be launched on a firm basis unless every supervisor understands that top management is looking to him to produce these results.

A full-time director and coordinator must be appointed to conduct the program. Work simplification needs the guidance of an individual who does not have any other responsibilities to distract him from his main purpose. The program is one which requires considerable time from each supervisor, therefore, it would be false economy to have weak and inadequate direction.

After the work simplification coordinator has been appointed and top management has expressed its support of the program, you are ready to start training the supervisors in the work simplification techniques. It is

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important that the program be properly presented to the supervisors at the inception of the training sessions. If the proper top management support has been established, the supervisors should be in a responsive mood when they appear for the first training session: however, it is not necessary to rely entirely on the top management authority in order to obtain the interest of supervisors. They should be convinced of the value inherent in knowing work simplification techniques. They should be given a background in the development of management analysis techniques and should be told that these techniques will be of value to them wherever they may be employed in a supervisory position. Supervisors should be made aware that work simplification offers a chance for them to get their ideas across to their bosses. It is rare to find a supervisor who does not have some idea which he would like to see adopted, but about which he has done little. Perhaps he is not sure in his own mind that the idea is good. Using the work simplification techniques, he can obtain all the facts required to develop the idea fully.

Materials for training

In the actual conduct of training sessions it is wise to make extensive use of printed material and visual aids. A good deal of material can best be compiled by applying the work simplification techniques to an actual organizational segment within the company. Printed copies of both the before and after studies can be used as instructional material in the training sessions. If the supervisors can be furnished with examples of the results obtained by using the techniques within their own company, they will take a more active part in the training sessions and will be more enthusiastic about applying the techniques to their own operations. Other material from outside sources such as reports on the results of work simplification in governmental agencies and private industry may be profitably used. There are also a number of film strips available which help to put over a work simplification program. These film strips make the program more alive and cause supervisors to realize that it has been tried and proven in other places.

The actual content of the training sessions involves both instructional and laboratory periods. In the former the supervisors learn what the techniques are and how to use them. After each is fully explained the supervisors are asked to return to their sections and actually apply these new techniques to their own operations. In the laboratory sessions they present their completed studies for discussion among the supervisors attending. Although as many as 15 supervisors may be scheduled for the instructional sessions, it is readily apparent that a limited number, not more than five, should be scheduled for the sessions.

Let us review the techniques which are given to the supervisors. There are three basic techniques which are widely used in work simplification—the work distribution chart, the process chart, and the work count. The work distribution chart may be defined as a device for analyzing the division of labor. Among other things this chart reveals the following deficiencies: *failure to delegate, waste of clerical skills, assignment of unrelated tasks,* and *overloading and underloading of employees.*

The first step in the preparation of the work distribution chart is to obtain a task list from each employee. This is merely a brief itemization of duties performed together with the approximate hours per week spent in the performance of each. In requesting the employees to complete the task list the supervisors should tell them it is strictly for information and not for any purpose of job classification or reduction in personnel.

The next step is to select the major activities being performed in the unit under study. In most cases the supervisor can easily determine his major activities. These major activities can be defined as the reasons for the existence of the organizational segment. For example, in a personnel office one of the main activities is processing new hires, transfers, and terminations. The total number of activities should be held to an essential minimum as an excessive number makes it difficult to analyze the work distribution chart. It would be rare to find more than ten activities on any one chart.

Six key questions

The next step is to group the tasks of the individual employees around the activities. In the completed work distribution chart the activities will appear in the first vertical column, the total man hours for these activities in the next vertical column, and the tasks with corresponding hours for each employee will appear in subsequent columns. The activity requiring the most time is listed first and the other activities follow in descending order. After completing the chart the next step is for the supervisor to remove himself as far as possible from his activities and to make an objective analysis of his work distribution. This analysis can be conducted by asking:

1. *What activities take the most time?*
2. *Is there any misdirected effort?*
3. *Are skills being used properly?*
4. *Are employees doing too many unrelated tasks?*
5. *Are tasks spread too thinly?*
6. *Is work distributed evenly?*

The second technique of work simplification is the process chart. This may be defined as a device for analyzing the flow of work. There are many types of process charts used by the professional analysts. Some of these charts have ten or more symbols employed in their construction. In the work simplification program it is necessary for the technique to be made as simple as possible: consequently, only four basic symbols are used—large circle for operation, small circle for transportation, triangle for storage, and square for inspection.

The supervisor will ask how he selects the process to be charted. The most profitable ones to chart are those which take the most time. Since this is true he should be referred to his work distribution chart for a key to the activities for charting. Another indication of the need for process charting is the repetition of operations. In a large personnel office the activity of processing a new employee might well be an activity for process charting. Once the object to be charted is selected, it is important to stay with it. One of the most frequent mistakes made in process charting is deviating from the object orginally selected for study. The process analyst should not allow himself to become distracted with some of the papers involved in the hiring process and start following one of the forms in preference to the individual.

After each step in the process is listed, it is important to record storage time in minutes and transportation distance in feet. These figures are very important in proper analysis of the complete process chart. For example, if in charting the hiring procedure it is found that a new employee is "in storage" for fifty minutes pending physical examination, it is an indication that this phase of the process should be looked into more thoroughly. The use of pre-printed process charts is recommended. These charts have the four symbols printed on each line; the symbol applicable to each step may then be indicated by merely filling it in with a pencil. Symbols may be connected by drawing lines from one line to the next.

Total the process chart

After all the steps are entered, the process chart should be totaled. Totals are shown for the transportation feet, the storage minutes, and the types of steps (operation, transportation, storage and inspection). The process chart is then ready for analysis. Here again there are six key questions—*what*, *when*, *why*, *who*, *where*, and *how*. As each one of these questions is asked of each step on the chart, the supervisor should obtain a very thorough analysis of the process and should begin to wonder about points which are subject to improvement. The results of the process study are formulated into an "afterstudy" showing achievements in reduction of transportation distance, storage time and procedure steps. This gives the supervisor concrete evidence about how he can sell his ideas to upper levels of management.

The third technique of work simplification is the work count. The work count is merely the application of statistics as an aid in determining the best method to be used. For example, registers are usually justified on the basis that they must be referred to at a subsequent date. The use of a register is analyzed on a process chart by the question "why is the step necessary?" In answering this question it is necessary to find out exactly how many times the register is referred to each month. Obtaining such information would represent an application of work count.

It is obvious that this third tool of work simplification is related to the other two. In many cases the proper analyses of the work distribution chart and process chart will depend upon applying work count or statistics to the task or step under study. There is no mechanical technique connected with work count such as with the other two tools, but the supervisor must be made conscious of the importance of applying statistics to the solutions of his problems. Proper application of work count will help the supervisor to relate tasks properly, to determine the value of actions, to divide work evenly, to estimate requirements for personnel and equipment, to schedule work accurately, and to locate bottlenecks. Where two groups of individuals are doing similar work, it may be used to compare their production efforts and thereby stimulate interest and competition between the two groups.

After the supervisors have been instructed in these three techniques, the really important phase of the program begins—getting results installed. Some improvements will have been effected by the supervisor on his own initiative, and as a result of suggestions made to him in the laboratory sessions. Other improvements beyond the authority of a supervisor must be developed and pushed by the work simplification coordinator. It is important that all ideas which the supervisors advance receive prompt action from the coordinator. If this is not done the supervisor can quickly lose interest in the program and reach the conclusion that management is not too concerned with getting results. The coordinator must be able to refer the broader suggestions for improvement to top management and get rapid decisions. It is extremely important that an "open door" policy at all levels of management exists. This can be fostered by requiring that those in authority above the first line supervisors make a periodic review of the activity and results of work simplification. It can also be encouraged by promoting a general policy that work simplification proposals must be given the highest priority and not put aside for long periods of time in preference to other work.

The question is often raised as to the difference between work simplification and an employee suggestion program. There are two points of distinction. Work simplification is for supervisors, whereas the suggestion program is for all employees. Secondly, work simplification is concerned with the normal requirements of the job, whereas suggestions are concerned with requirements beyond the scope of the job. It is rare to find supervisors participating to any extent in a suggestion program. It is therefore important that their ideas be stimulated by another program such as work simplification.

If the support of management is to be positive and continuous, management must be kept informed of results. This requires that supervisors submit brief reports

(*Continued on page 20*)

The Human Factor in Systems Work

A reminder, if one be needed, that employees are people too.

By Victor H. Roman

IT is, indeed, timely and appropriate to discuss this subject, as I believe we all appreciate the very important part the humane technique contributes toward the success of our endeavors in the systems and procedures field.

For the purpose of this discussion, let us, as the first step, define what is meant by *Systems*. Broadly, the term is interpreted as "The organized arrangement of personnel and equipment in order to derive the most efficient, practicable, adequate, and economical performance of all office accounting and clerical functions." The definition of *human factor* as applied to systems is a little more nebulous. However, I believe we can define this human factor as "The effect on morale and the personal reactions created by the systems man in his professional contacts."

Most all of us can look back to the period when men in systems work were referred to as efficiency experts. As such, these men generally performed their activities in a matter-of-fact and mechanical fashion, giving little, if any, attention to the human factor involved. I also recall the autocratic manner usually assumed during this era by persons who performed this kind of work. The efficiency experts were frequently looked upon as men who were out to get peoples' jobs. And the cases where friendships grew between efficiency experts and the persons whose offices they visited were conspicuous by their absence. Or, as someone aptly expressed it: "A plague of locusts every year instead of every seven would be far more welcome than a second visit from an efficiency expert."

In more recent years it has been recognized that the human factor plays an important part in systems work and has a definite bearing on the results obtained by the systems analysts. Coincident with this gradual transition from efficiency experts to systems men, there has also been a general tendency on the part of management toward appreciation of this human factor in dealing with their employees. We should accept the premise that the average worker engaged in clerical and accounting activities instinctively wishes to do a good job, and that he takes a certain amount of pride in his work. Surely, then, the human factor exercised in his regard, which imparts a feeling of security, job satisfaction and the justifiable pride that comes of recognition, is most essential to building his good will, thus furthering his desire to do a good job.

On the whole, industry has gone all out to improve working conditions, as it is recognized that improved working conditions foster increased production. These improved working conditions can also be interpreted as human factors. Happy people emanate a feeling of well-being. Their minds are at ease. They are well adjusted—and, being well adjusted, they are willing and able to perform a good job. So we do have very definite proof that the human factor plays a most important part in all personal contacts, whether they be managerial, supervisory, or the contacts of a systems man in the course of his various assignments.

Let us tie down this discussion to at least some of the way-points in the systems analyst's routine where the human factor very definitely applies. But first, one more general statement: We know that everyone resents *change* (and in so saying, I do not believe that I am too all-inclusive). Everyone resents *change* to a certain degree. The degree of resentment and its accompanying resistance varies with the age of the person affected. This dislike for change is just human instinct, and applies principally to conditions where someone else is causing the change to be made. Right here we have an opportunity and a duty to inject the human factor in our line of work. It applies not only to the man-on-the-desk, but all through the organization, starting at the very top where the proposal for changing a system must be approved.

Now let us consider a normal assignment, and, for the purpose of detecting where the human factor applies in each case, we shall break down this assignment into its major elements, functions, and contacts—starting with:

Receiving the Assignment

An assignment usually comes from one of two sources:

1. A new requirement necessitating design of a system for handling an entirely new function, or
2. The apparent need for improving an existing system.

Here we encounter just a smattering of the human factor element which applies in the manner of receiving the assignment from management. There are problems of creating confidence within the organization being sur-

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veyed and of assuring management that the survey will be conducted with the very minimum of disruption and that uneasiness within the organization will be guarded against. *The next step is*:

Planning the Survey

On larger-type projects, the complement of the survey crew should include a member of the organization being surveyed. This not only materially assists the survey analyst, but also creates a feeling of serenity on the part of the organization being examined. They know they have a representative, an ally, and that, as a result, their interests will receive due consideration from someone with whom they are closely associated and whose interests are their interests.

The plan should also provide for disposition of surplus positions. When possible, any surplus personnel should be absorbed by normal employee turnover rather than being laid off, or dismissed.

Conducting the Survey

The human factor becomes even more pertinent as the work actually gets underway. First impressions are important and create either favorable or unfavorable reactions on the part of the organization being reviewed. Therefore, during the initial contact with the supervisory staff and, most assuredly, with the clerical workers, it is very important to sell the project as one intended to improve work methods and help them find the best manner of performing their particular assignment.

When discussing job duties with each of the personnel, a friendly attitude will promote confidence and dispel the apprehension which is generally present when a survey is getting started. Criticism of any existing procedures or routines is most inadvisable. Comments favorable to existing conditions or practices create good will and, when warranted, should be expressed.

It is desirable to solicit employees' suggestions relative to work improvement, as they not only assist the analyst, but also create a feeling of participation in the project. As the interview with each employee is concluded, it is well to review your notes with the individual to be certain they are factual and complete. This precludes your returning for more data, and also insures against possible misunderstanding later on. A review with the supervisor of the findings resulting from contacts with the personnel coming under his supervision will often disclose omissions or exaggerations which can be corrected without reinterviewing the individual.

During all of these contacts, a special effort should be made to create as little disturbance of normal routine as is consistent with the analyst's requirements. And, above all, conversation or actions which might create a feeling of suspicion or unrest to the extent your recommendations will reduce personnel should be guarded against.

The analyst should consider well the fact that he may wish to return to the same organization as a follow-up, or to conduct another survey, in which event the good will, helpful suggestions, and co-operation of the personnel are contributing elements necessary to performing his assignment successfully. Furthermore, these contributing elements are essential if the proposed changes in methods are to be successfully carried out and perpetuated. An attitude of fairness and friendliness throughout all of these contacts will cultivate confidence and a spirit of co-operation—both of which are important assets to the systems analyst.

Frequently, as a survey progresses, minor changes, which can be placed in effect at once, become apparent. To make such changes currently permits taking immediate advantage of any improvement or savings, and also lessens the extent of change to be made when the survey is completed. Thus it has the advantage of softening the effect of change on the personnel. Remember, we all resent change, and gradual transition is preferable to a major revision.

When finalizing a system or procedure and fixing job assignments, the human factor is again contemplated. If practicable, those types of work entailing monotonous detail, less interesting functions, and heavy, repetitive volume jobs should be considered to the extent of spreading the activity when job classifications, work flow, and sound operations will permit.

Findings and Recommendations

The human factor also plays an important part in convincing management. It is essential to evaluate the management point-of-view during consideration of what has been found and what will be recommended, because the proposal must be sold to management. Criticism of any existing practice should be minimized as management has generally suggested or approved the operation. It is well to comment favorably about those practices which are proving quite satisfactory. Include recognition of the co-operation received and all worthwhile ideas and suggestions contributed by employees on the job.

Up to this point, my comments have been somewhat one-sided. Please do not misunderstand my philosophy in this regard, as I firmly believe a systems man has a job to do and must perform his assignment with full consideration for the company's interest; this is his first responsibility. My remarks are intended to demonstrate that, all through the assignment, the human factor can be employed as an assistance to this prime responsibility. It must not be employed to the extent of compromising a position or weakening any constructive ideas produced by the survey.

Systems Installation

Preparatory to installing the system, training of personnel is of course indispensable. Application of the human factor to this training lies in instilling in the

minds of the employees an appreciation of the fact that this training has a twofold purpose:

1. To minimize effort on the part of the employees themselves in changing from one system to another.
2. To enable the personnel to handle the work load with a minimum of interruption and confusion during the transition period.

The better the training the less the confusion. The less the confusion the better the morale. Bear in mind that selling the personnel on the new system is a *must* because, unless the employees are sold on the fact that an improvement is being introduced, it is difficult to obtain their wholehearted support and cooperation.

Errors are usually prevalent in the transition period. The human factor plays an important role in the manner used when referring these errors to the people responsible for them. The initial stages of any new system are trying on the people who must operate it. Overtime causes fatigue which, in turn, has a tendency to affect the dispositions of those concerned. On occasions it has also been known to cause strained family relations. Therefore, excessive overtime on the part of the employees should be frowned upon. Any installation can be made easier and less trying on all concerned if the systems analyst responsible for the changeover employs an attitude of kindliness and helpfulness.

While I have not covered every detail of a systems analyst's activities, nevertheless, it is my positive opinion that the human factor does have a definite application to every phase of this type of work for the logical reason that, directly or indirectly, the systems man's efforts are closely associated with personal contacts. He also has the responsibility to make certain that, as he finishes his assignment and departs, the office morale is at least equal to, if not better than, that which prevailed prior to his arrival. A request for the services of a systems man is in itself a strong indication that improvements are in order. It therefore follows that establishment of these improvements should strengthen moral in the organization.

Work Simplification

(*from page 17*)

on each improvement which is effected. These reports will describe the activity before study, after study, and the total savings. Reports will be submitted to the coordinator who will prepare a summary report on participation and savings which he will submit to management.

After the training sessions have been conducted and the supervisors have applied the techniques to their operations, they sometimes have a tendency to lose interest in the program. Therefore it is important to have the means for maintaining its vitality. The particularly outstanding improvements which have resulted in large savings should be given appropriate recognition in the company house magazine or newspaper. In addition, a periodic report of savings by various organizational elements will help to create competition and increase participation.

Throughout the operation of work simplification it is important to keep the purpose of the program clearly in mind—to do a better job with less effort and less time. Never let the program acquire the status of a device to change an individual's job classification or to achieve mass eliminations of personnel from the payroll. Finally, it should always be remembered that the program is designed for supervisors and the credit for its success should go to them.

Microfilm Costs

(*from page 11*)

If the records to be microfilmed involve Government contracts be sure to check on the Government regulations. There are definite regulations regarding certification of authenticity and size and quality of film. Arrange for description targets on the film, proper marking and filing of the reels and above all a good log and index for future reference.

When the job was finished our records disclosed the following:

424 boxes of records filmed
6030 man hours of labor
552 reels of film
2,037,670 shots or exposures

With a little arithmetic we came up with an average of 4806 sheets per box, and 338 shots per hour—this latter a far cry from the machine manufacturers' claimed speed of operation.

Our actual cost was $7934.37 and of this $5418.57 was labor and supervision, $482 machine rental and $2034 film and developing expense. This works out to 68 per cent labor, 6 per cent machine rental and 26 per cent film and developing expense. It also shows $18.71 per box or $.0039 per shot.

This job was done about three years ago. In an effort to estimate today's cost for this same job I reduced the labor hours by 40 per cent, I removed the staple obstacle, extended the balance at $1.50 per hour, added 20 per cent to machine rental and 10 per cent to film and developing expense and came up with a total figure of $8242.80. This will divide 66 per cent labor, 7 percent machine rental and 27 per cent film and developing expense. It shows $19.42 per box or $.004 per shot.

A comparison with public warehouse storage rates would seem to indicate it would take five to six years to equal this rate per box. This is a rough estimate and does make allowance for drayage, shelving facilities, aisle space, etc. Don't back me into a corner to explain this comparison but I did think fellow members around the country would be interested in our estimate of it anyway.

The Systems Man in National Defense

By James V. Lester

THE Defense Program presents both a challenge and an opportunity to Systems and Procedures specialists. The rapid increase in our armed forces and the phenomenal growth of federal government agencies in themselves constitute a rich field for such work. Anyone who has tangled with Washington red tape in recent months is well aware of the urgent need for better systems and procedures. Today every commercial and industrial firm is affected by the Defense Program.

This program has two objectives: first, a rapid build-up of our armed strength; and second, an increase in our capacity to produce goods and services in quantities large enough to support a strong civilian economy as well. We want guns and butter both. Such a program necessarily means that business must operate in a defense economy. With the experiences of World War II still fresh in our minds, the characteristics of such an economy are easy to enumerate.

First, government control of business operations becomes of major importance. We have a flood of complex regulations. With the positive appeal of patriotism and the negative force of stiff penalties for violations, business has no choice but to comply with such rules. Since these regulations are largely self-policing, records that prove compliance are absolutely essential. This complex record-keeping job is made even more difficult because the rules of the game change rapidly. The ability to "turn around" quickly is essential. Moreover, in many cases, action by the government is unpredictable, and many official statements of policy are unreliable. Anyone who has followed price controls can verify this statement. So far, government controls have covered the following areas of business operations: purchasing, production, distribution, prices, wages, credit, construction and profit.

Taxes make for spending

Second, many commercial and industrial concerns earn high operating profits which are then largely taxed or re-negotiated away. This characteristic of a defense economy is by no means uniform or universal. The machine tool industry, for example, is enjoying a tremendous demand for its product, while television manufacturers are not exactly overwhelmed by orders. For even the boom industries, however, high profits are not without corresponding problems. Wasteful habits are very easy to acquire and very difficult to eliminate. While a high volume may hide defects, competition will some day return and wasteful habits may then prove fatal to the enterprise. On the other hand, the prospect of excess profits taxes and re-negotiation siphoning off seventy to eighty cents off the top profit dollar does give management an incentive to spend money on projects that hold promise of future benefits to the organization. Beardsley Ruml has gone so far as to state that payment of excess profits taxes may be a symptom of poor management on the theory that we ought to be able to spend twenty or thirty cent dollars intelligently.

Third, business operates on an emergency basis. Unskilled and inadequately trained personnel are rushed into operations. Supervision is diluted. Inventories are too low—unbalanced. Cumbersome backlogs of orders pile up. Paperwork multiplies. Short cuts are attempted and lead to confusion. Rush jobs are permitted to disrupt schedules. Planning must be done far ahead to give effect to long delivery dates on purchases. Old customs and trade practices change. Relations with customers and suppliers become strained. Cost determination for cost plus contracts becomes more important than cost control. Standards become obsolete. There are more papers, more rules, more telegrams, more "hot" jobs, more red tape—more of everything except that most precious commodity—time.

What does this mean to the systems and procedures man? What are his new responsibilities and opportunities? To answer these questions in a very specific and down-to-earth way, let's pick a typical industrial company and see how systems and procedures men can help solve its problems.

Montgomery Mfg. Co. is a medium-sized Company which, for the last 25 years, has produced a line of ball and roller bearings. Montgomery's products are used as component parts in the manufacture of automobiles, farm tractors and aircraft. There is also a steady demand for these bearings as repair parts. Sales are made through several hundred independent industrial distributors and also direct to about one hundred manufacturers. There are thousands of different sizes and types—some standard, some special.

Keep abreast of regulations

What then should Montgomery's Systems and Procedures Department do to make a maximum contribution to the success of the company? We can start out with some generalizations and then get specific. If they are to serve well, they must keep informed about government controls. It is obviously not necessary for systems and procedures men to be experts in this field, but they must have a working knowledge of the regulations. The best

way to do this is by getting in the habit of reading about government controls. There is an abundance of information available in, for example, the *Wall Street Journal*, trade association releases, trade magazines, etc. The systems and procedures men must also keep in touch with the various divisions of the company to learn how these government controls affect their operations. This is a wonderful opportunity to "sell" services to other departments. Moreover, the systems and procedures men must remain flexible. They must be able to handle several projects at once. They must act quickly to adapt methods to rapidly changing circumstances. They must develop a sense of values, giving top priority to the problems most important to the success of the company as a whole.

So much for generalizations. Now let's get specific about Montgomery's problems under CMP (Controlled Materials Plan), for example. Our systems and procedures men know that bearings are "B" products handled by the General Components Division of NPA. Montgomery's customers get DO ratings for bearings along with their CMP allotments if the bearings are used as components in producing autos, tractors, and aircraft. The repair and maintenance customers can rate their own orders under Regulation 5 as DO-MRO. Montgomery's sales manager has certain definite objectives. He wants to keep established customers happy and also get good accounts away from competition. Obviously, he also wants to comply with regulations. The systems and procedures men can help him by developing a procedure for screening new orders for DO ratings and preparing form letters to obtain corrections of improper certifications. They can devise methods to insure the filling of orders in the proper sequence. They can help design a system for keeping Montgomery's salesmen and customers informed of the latest rules. A procedure for tabulating orders and shipments by DO ratings will also be useful.

Purchasing, under CMP, must set up and maintain a bookkeeping system on steel. The systems and procedures men can adapt present forms and procedures to provide these records as a by-product of regular cost accounting rather than by duplicating such work. They can set up ways to tabulate the required data with automatic warning signals when purchases, inventories or usage approach legal limits. The preparation of the CMP applications themselves can be facilitated.

Need revised procedures

Production departments need procedures to insure conformity with authorized schedules. A way must be devised to inform Production which orders can use restricted materials such as cadmium or nickel plating. There must be new and better coordination of production schedules for specific types and sizes of bearings with incoming orders and with inventory and backlogs.

Regarding price controls, systems and procedures men can also make a contribution. Bearings are covered by CPR 30. While the administration of the Capehart amendment provisions has added to the confusion about allowable cost, there is much that can be done. The systems and procedures men can develop procedures for collecting and documenting cost and price data. They can establish methods for determining best sellers in each line. The order-billing department can use help in selecting the best way to certify compliance with ceiling price regulations. Purchasing would like a method of making certain that the prices they pay are within the regulations.

Regarding re-negotiation, Montgomery has a real problem. The Re-negotiation Act of 1951 has broadened the kinds of prime and subcontracts subject to re-negotiation. Although this law applies to all sales beginning with January 1, 1951, the President only recently started to appoint members to the Re-negotiation Board, and regulations have not been issued. However, from reading the 1951 Act and studying the 1948 regulations, the probabilities can be predicted. Since Montgomery rarely sells direct to the government, most of its re-negotiable business is on a subcontract basis. The problem of establishing exactly which sales are subject is very complex, especially since the bearings ultimately used on a government job may move through several tiers of subcontractors. Even after this problem is solved, the best way of tabulating such sales requires considerable study. Since Montgomery's orders are typically for small dollar amounts, the quantity of papers involved is staggering over a year. If the job is not done properly in the first place, duplication of effort will be very costly.

To combat the tendency towards wasteful practices, systems men must develop new and cheaper forms and procedures. They must avoid complicating systems under present conditions to the extent that complete revisions will be necessary if controls are substantially modified or removed. On the other hand, systems men are in an excellent position to call management's attention to projects that will reduce costs in the future. They can help spend some of the twenty cent dollars constructively.

Montgomery, like other companies, is operating on an emergency basis and systems and procedures has a positive duty to make the return to orderly and economical performance as rapid as is humanly possible. To combat the unskilled help problem, complex clerical tasks can be simplified and made repetitive. Write-ups can be used in training new personnel. The order-billing system can be revised to operate more smoothly under conditions of poor stock. We can increase productivity by better layout, improved flow of paperwork and mechanization of manual operations. To assist supervision, better measures of input and output must be established along with realistic, current standards of performance.

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